California Waste Tire Generation, Markets, and Disposal: 2006 CIWMB Staff Report

Introduction

California is faced with the significant challenge of diverting or safely managing waste tires, with approximately 44.4 million waste tires generated in 2006. A "waste tire" is a tire that is not mounted on a vehicle and is unsuitable for use as a vehicle tire (See Public Resource Code Section 42807).

This report provides estimates of waste tire generation, diversion, and disposal in California for 2006. The data sources for this report are a comprehensive waste tire industry survey of over forty businesses, the Rubber Manufacturers Association (RMA), and the Tire Retread Information Bureau (TRIB).

For 2006, CIWMB staff again conducted the annual waste tire industry survey. The waste tire survey asked participants for information on tire diversion and disposal. An estimate of waste tire generation was determined by adding disposal and diversion.

Estimates of Waste Tires Generated

Various government and private entities use different approaches to develop estimates of waste tire generation. The U.S. Environmental Protection Agency (U.S. EPA) calculates the number of waste tires by using the generation factor of one waste tire per person per year to obtain an average for the nation. In addition to California, thirty-seven other states estimate waste tire generation. Twenty-three of these states use the U.S. EPA generation factor of one tire per person per year. Fourteen states use other methods to develop their estimates, such as tracking revenues collected on tire sales, tracking waste tires collected, industry surveys, and State-created model estimates.

California Waste Tires Generated

CIWMB staff relied on the annual waste tire industry survey to calculate the number of waste tires generated. Because of driving practices of Californians, such as commuting long distances, it appears that California's waste tire generation factor is slightly higher than U.S. EPA's one tire per person per year.

For 2006, CIWMB staff estimated the waste tire generation factor was 1.2 tires per person per year, based on 44.4 million waste tires generated divided by California's 2006 population of 37.2 million people.

The California State University, Sacramento (CSUS) waste tire estimation model[1] validates that the waste tire generation factor for California should be slightly higher than US EPA's one tire per person per year. The model estimates the average waste tire generation for California in 2006 was 1.23 tires per person per year.

Passenger Tire Equivalents (PTE)

Passenger Tire Equivalents (PTE) is defined in Title 14, California Code of Regulations (CCR) 17225.770:

> "Passenger Tire Equivalents" means the total weight of altered waste tires, in pounds divided by 20 pounds. This definition

[1] CIWMB, Contract Report, Estimating Annual Waste Tire Generation, Diversion and Disposal in CA, Prepared by CSUS in June, 2007.

replaces the previous definition of "Tire Equivalents."

A waste tire generation factor of one tire per person per year is not the same as one PTE per person per year. A PTE weight of 20 pounds was originally used by RMA in 1990. According to RMA's 2005 report, *Scrap Tire Markets in the United States*, the average weight for waste (scrap) passenger and light truck tires is 22.5 pounds or 89 tires to the ton. For all waste tires, the average weight is 33 pounds. CIWMB continues to use an average weight of 20 pounds or 100 tires to a ton for waste tires as set in 14 CCR 17225.770.

PTE is used as a unit for comparison, since tires vary considerably in weight—from 16 pounds for a small passenger tire (according to the CSUS study) to 110 pounds for an average commercial tire. PTE is a convenient "measure" of waste tire generation. Throughout this report a "waste tire" equals one PTE. Table 1 shows waste tire generation in PTE and Table 2 shows waste tire generation in tons.

Markets, Reuse, or Diversion for Waste Tires

Reuse

An alternative to disposal is tire reuse. After the purchase of new tires, the remaining discarded but reusable tires that still have a legal tread depth can be resold by a dealer, rather than being disposed prematurely.

Based on information from industry contacts, 2.1 million (4.7 percent) of the estimated 44.4 million waste tires generated in 2006 were resold or reused in California.

Export Tires

Waste tire export reduces the number of tires requiring eventual disposal in California. According to industry contacts and CIWMB staff estimates, approximately 1.9 million waste tires (4.3 percent) were exported in 2006. Major export destinations for California waste tires include Mexico and Asia.

Crumb Rubber

About 2.7 million waste tires (6.1 percent) were used to produce crumb rubber to manufacture tire-derived products, including playground cover, speed bumps, carpet tile, roofing, mats, and other various tire-derived molded products.

Rubberized Asphalt Concrete

In addition to crumb rubber uses described above, 3.9 million waste tires (8.8 percent) were used for rubberized asphalt concrete (RAC) in 2006. Currently, RAC is initially more costly than traditional asphalt paving, but it is quieter, more durable and is typically more cost-effective over its lifecycle.

Civil Engineering Uses

Civil engineering projects (CE), such as landfill gas collection trenches, lightweight fill, and a levee reinforcement project consumed about 3.3 million waste tires (7.4 percent).

Alternative Daily Cover

For 2006, CIWMB staff estimates 4.5 million waste tires (10.1 percent) were used as alternative daily cover (ADC) at California landfills.

Agriculture and Other Uses

About 3.3 million waste tires (7.4 percent) were used for non-residential applications such as whole tires for haystack tarp weights and ground tire rubber products for athletic surfaces.

Retreading

Retreading is a viable option for renewing waste tires by reusing the tire casing after the tread has worn off beyond legal limits. Based on surveys, industry contacts, and information obtained from the Tire Retread Information Bureau at www.retread.org, the average weight of a retreaded truck tire is 120 pounds, or six PTE as reported in Table 1. For 2006, CIWMB staff estimates about 4.4 million waste tires (9.9 percent) were retreaded.

Tire-Derived Fuel

Nationwide, tire-derived fuel (TDF) is the biggest market for waste tires. According to RMA, TDF accounted for about 155 million tires in the U.S. in 2006, or about 52 percent of the total U.S. waste tires generated.

In California, total TDF accounted for about 8.3 million waste tires (18.7 percent), of which 1.3 million were used for fuel in power plants and

7.0 million were used as a fuel supplement for cement kilns.

Import

CIWMB staff estimated that in 2006 approximately 1.4 million waste tires were imported into California for recycling from Utah, Oregon, Nevada, and Arizona. Imported waste tires were used as TDF and raw material to generate crumb rubber. These imported waste tires are not included in calculating California's waste tire generation.

Disposal to Landfills

California prohibits disposal of whole tires to landfills. Only altered or shredded pieces of tires may be disposed to landfills. CIWMB staff estimated that 11.4 million waste tires (25.7 percent) were disposed to landfills in 2006.

Summary

California generated approximately 44.4 million waste tires in 2006. Of this total, approximately 33.0 million waste tires (or 74 percent) were diverted from disposal through reuse, crumb rubber, rubberized asphalt concrete, civil engineering, alternative daily cover, agriculture, retreading and tire-derived fuels for power generation and cement kilns. The remaining 11.4 million waste tires (about 25.6 percent) were disposed to landfills.

The following tables and figures provide the detailed information.

For 2006, California waste tire generation, diversion, and disposal are shown in PTE (Table 1) and in tons (Table 2).

Figure 1 displays information about waste tire disposal, diversion and diversion rates in California from 2004 to 2006. The waste tire diversion rate was 71 percent in 2004 and increased to 74 percent in 2006. Please note that previously published 2004 and 2005 data have been updated to reflect more accurate information.

Figure 2 includes the estimated number of 2006 waste tires diverted and disposed.

Table 1: California Waste Tire Generation, Diversion, and Disposal, 2006
(Numbers in millions of passenger tire equivalents [PTE[1]])

Generation	Diversion Types										Import[4]	Diversion[5]	Disposal[6]	Diversion %[7]
	Reuse (Resale)	Crumb Rubber	RAC	CE	ADC	Agriculture & Others[2]	Retread[3]	Export	TDF (Power)	TDF (Cement)				
44.4	2.1	2.7	3.9	3.3	4.5	3.3	4.4	1.9	1.3	7.0	1.4	33.0	11.4	74

Notes: RAC = Rubberized Asphalt Concrete
CE = Civil Engineering
ADC = Alternative Daily Cover
TDF= Tire-Derived Fuel

1. Based on 20 lbs. average weight of a passenger car tire.
2. "Agriculture and Others" includes whole waste tires used as tarp weights for haystacks, and ground waste tire rubber products such as athletic surfaces and running trails.
3. Retread tries are mainly medium- and heavy-truck tires. CIWMB staff use an average weight of 120 pounds per retread tire as recommended by Tire Retread Information Bureau at www.retread.org.
4. Includes tires imported for combustion as a fuel supplement or used to generate crumb rubber.
5. Determined by subtracting imported tires from the sum of all diversion types.
6. Determined by summing the number of tires landfilled.
7. The percentage of waste tires diverted (calculated by dividing the # of PTEs diverted by the # of PTEs generated).

Table 2: California Waste Tire Generation, Diversion, and Disposal, 2006
(Numbers in thousands of tons rounded to nearest ton)

Generation	Diversion Types										Import[3]	Diversion[4]	Disposal[5]	Diversion %[6]
	Reuse (Resale)	Crumb Rubber	RAC	CE	ADC	Agriculture & Others[1]	Retread[2]	Export	TDF (Power)	TDF (Cement)				
444	21	27	39	33	45	33	44	19	13	70	14	331	114	74

Notes: RAC = Rubberized Asphalt Concrete
CE = Civil Engineering
ADC = Alternative Daily Cover
TDF = Tire-Derived Fuel

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4. Determined by subtracting imported tires from the sum of all diversion types.

5. Determined by summing the number of tires landfilled.

6. The percentage of waste tires diverted (calculated by dividing the tons of tires diverted by the tons of tires generated).

Figure 1: California Waste Tire Disposal, Diversion, and Diversion Rates (%) for 2004 to 2006

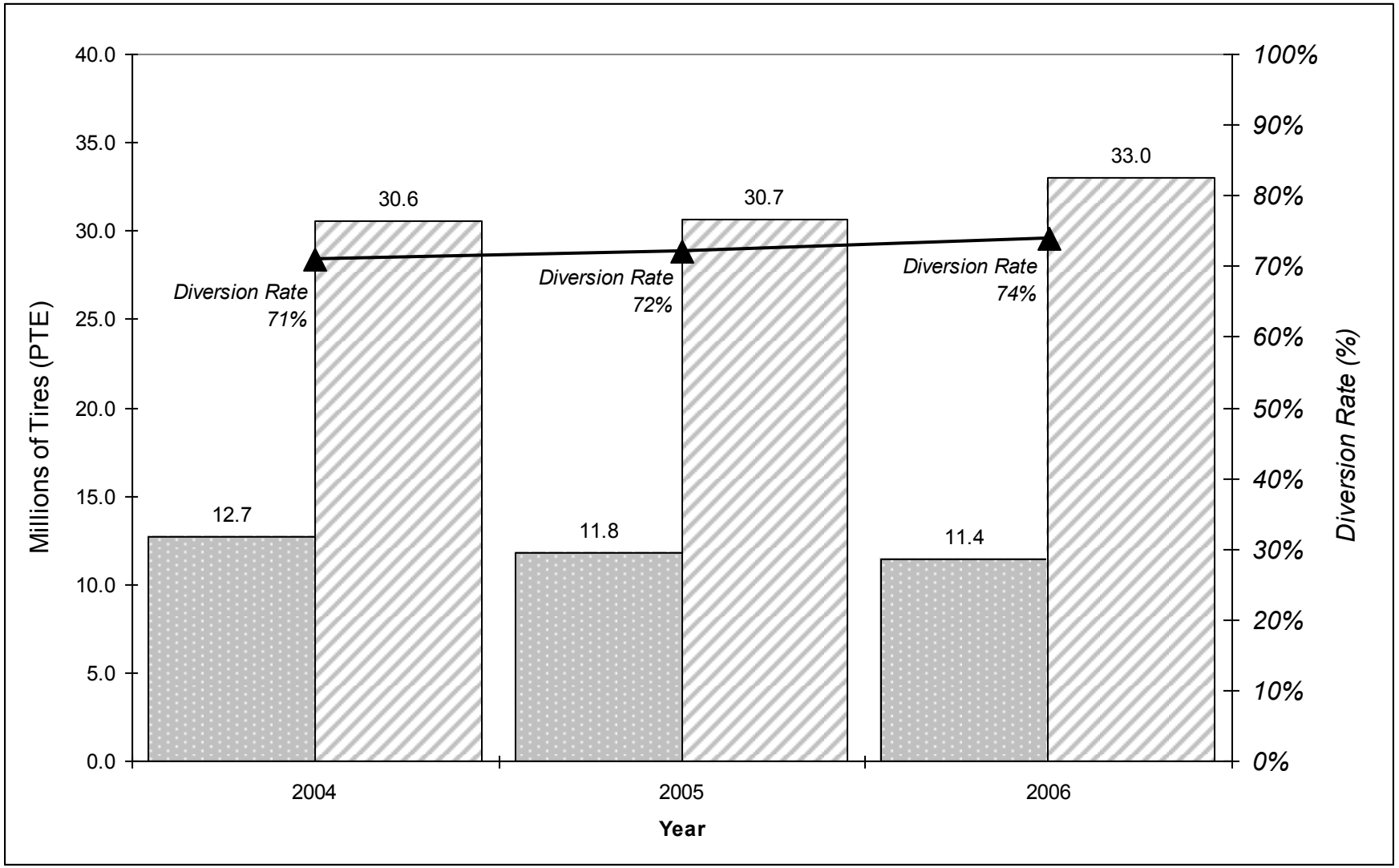
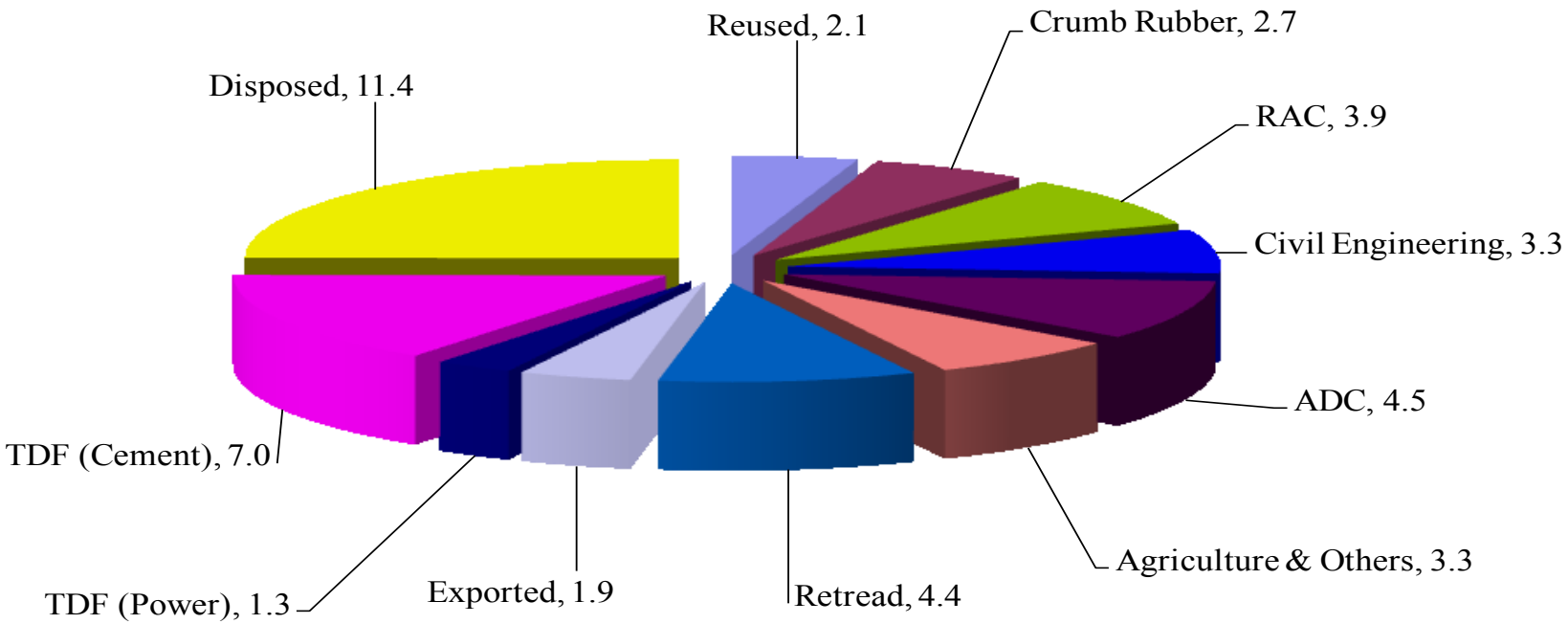


Figure 2: Estimated Waste Tire Diversion and Disposal, 2006
(Numbers in millions of passenger tire equivalents [PTE])



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